

Lesson Plan

Campus Debris and the Ocean

FOCUS

This lesson is designed to allow students to actively make connections between trash found on their campus and debris found in marine ecosystems. Students will learn about debris and how it affects marine animals by learning about boluses, and then they will participate in a campus debris survey. Students will analyze their data using charts and an excel workbook. Finally students will create a public service campaign aimed at maintaining a debris-free campus.

FOCUS QUESTIONS

Where does marine debris come from?
What sources of debris are on our school campus?

Are the types of debris found on our campus the same types of debris found on beach cleanups?

LEARNING OBJECTIVE

Describe the impacts of marine debris on marine animals.

Follow a scientific procedure to survey campus debris.

Relate campus debris to marine debris using the concept of watersheds.

Compare the debris found on campus to debris collected at the California Coastal Survey.

Create a public service campaign to raise awareness of the danger of debris to a marine ecosystem.

GRADE LEVEL

6-12

MATERIALS

- Gloves
- One kitchen sized garbage bag for each pair of students
- Campus Debris Data Sheet
- Campus Debris Data Summary Excel Workbook or Campus Debris Data Summary Data Sheet
- Computer lab with internet access and Microsoft Excel*

* **NOTE:** If computer lab or internet access is unavailable, simply print out the necessary sections from the www.signalsofspring.net/aces website for students to read in **Part 1**. If possible, project some of the images from the website in color. For **Part 2**, if Excel is unavailable, students will construct the graphs by hand instead of using Excel.

TEACHING TIME

2-3 sessions, one for campus debris survey/data collection; one for data entry, data analysis, campaign planning

SEATING ARRANGEMENT



Various, part of activity is on campus out of the classroom, at computers in groups no more than 3

MAXIMUM NUMBER OF STUDENTS

35

KEY WORDS

Marine debris
Source
Watershed
Ingestion/entanglement
Prevention
recycling

BACKGROUND INFORMATION

Marine debris is a global issue for marine wildlife. Our society has increased its use of disposable, single use products, and much of it ends up in the ocean. It is estimated that 80% of the debris in the ocean originates from land based sources, making its way to the ocean via watersheds, (creeks, rivers, pathways to the ocean). Marine debris is hazardous if not deadly to marine life, and potentially humans too, as we eat fish. Walk out to a creek, storm drain, or beach after a heavy rain and you will likely see garbage that has originated on land and made its way to the coast and ocean. Many animals like sea turtles, seabirds such as albatrosses, and even whales have died of ingestion of plastic and garbage.

This activity looks to a local source of debris and the students investigate their local environment, their school, as a potential source for marine debris. Students then enter their data into an excel spreadsheet that will automatically

populate a graph to tally up the types of debris that were on their campus. They compare their debris survey with a 21-year data set from the CA Coastal Cleanup data. Students can also analyze color and discuss color of items in the ocean and how that may impact animals that may ingest marine debris. By doing a campus collection/survey and analyzing the types of garbage they found they will make the connection between their community and ocean health and identify behavior modification that will help contribute to a healthier ocean.

PREPARATION

Assemble data collection sheets and make sure you have excel spreadsheet loaded on computers for students to enter data on (if using the excel spreadsheet). Assemble campus debris survey materials (bags, gloves, datasheets, etc), you may need to work with and inform campus administration before sending students out on campus during a class period.

LEARNING PROCEDURE

Part 1

Introduction to Marine Debris

Ask:

What do you think marine debris is?

Garbage in the ocean.

How does it get there?

Allow students to share their ideas—they may explain that the debris comes from ships, ocean dumping, or runoff from the land.

While the latter is the most significant



source of marine debris, if students are unaware of this fact, do not reveal it yet.

How do you think marine debris affects marine organisms?

Allow students to share their ideas. Possible answers include:

- Birds, seals, turtles, or fish may become entangled in fishing line and other debris*
- Many of these animals mistakenly eat plastics*

Direct students to read the section of the Signals of Spring website [www.signalsofspring.net/aces](http://www.signalsofpring.net/aces) entitled, "Exploring Pollution Solutions" and to answer the questions that follow. Students should work individually or in pairs for this short activity.

Follow the steps below to learn more about marine debris.

- Go to: www.marinedebris.noaa.gov or to www.signalsofspring.net/aces and
- In the 'Issues & Ways to Protect the Environment' circle, click on 'Exploring Pollution Solutions.'
- Click on 'Marine Debris.'
- Read the information and answer the following questions:

1. What does most marine debris consist of? Why?

Most marine debris is plastic, which floats

on the surface of the water.

2. Give at least 3 examples of marine animals that are affected by marine debris. Explain how each is affected.

Answers will vary.

3. What is the major source of marine debris? How does it get to the ocean?

Most marine debris comes from land. It enters the ocean through watersheds.

4. What are the Pacific Garbage Patches?

These are large areas in the Pacific Ocean where marine debris has collected due to circulating wind and water currents called gyres.

Bring the class back to the whole group. Ask students to share some examples of how marine debris affects marine animals.

Ask:

Does our community contribute to marine debris? How?

Yes. Since almost every watershed leads to the ocean, debris left on the ground in any community is likely to eventually enter the ocean.

Part 2:

Campus Debris Survey

Say:

"Today we are going to assess how much debris on our school campus could potentially become marine debris."

- Divide students into groups of 4-5 for the Campus Debris Survey.



- Assign each group a specific part of the school campus to survey. *(Before hand, work with school administration to inform them student will be doing an activity on campus during the class period)*
- Assign one member of each group as: collector, bag holder, recorder, and time keeper.
- Ask students to hypothesize what they think will be the most common form of campus debris and record their answer on the data sheet.
- The recorder should jot down any notes that are pertinent to the survey (i.e. most of the bottle caps were found outside the cafeteria).

• Give students 15 minutes to survey their plot of land/campus and to place all non-natural objects in their garbage bags. As they work, the Recorders should tally the number of items found in each category onto the data sheets.

• Once they return to class, student teams should answer the questions that follow the data sheet.

Campus Debris Questions:

1. What was your debris rate? You can calculate this by using this formula:

Total # items / 15 minutes = _____ items / minute

2. Which items can be recycled?

Items such as beverage cans and bottles, glass, etc.

3. What was the source of the most common items?

Answers will vary.

4. What campus location had the most debris?

Answers will vary.

5. Which items could entangle marine life?

Answers will vary but may include rope/line, six pack rings, etc.

6. Which items could be eaten by marine life?

Names in group: _____ Date: _____
Data Manager- _____
Spotter- _____
Cleaner- _____

Campus Debris Survey

Instructions:			
Enter the number of items you found on your campus debris survey in the column entitled "Total number of items"			
List the START time of the survey here:			
List the END time of the survey here:			
Enter BEFORE or AFTER lunch here:			
	Tally here	Color of item	Total number of items
Enter			
Food wrappers			
Plastic bottles			
Plastic Caps/lids			
Plastic bags			
Beverage cans			
Straws & stirrers			
Cups & utensils			
Other			
Grand Total			
Enter Debris-Rate (Total # items/15 min) here:			
Comments and Interpretation:			

Color Analysis Codes for Debris: whites/off whites yellows/tans blacks/browns
reds/oranges/pinks greens/blues/violets

***Safety Notes:** Consider students wearing gloves and instruct them not to pick up objects that are sharp and/or unidentifiable.



Many items, including plastic bags, bottle caps, small toys, etc.

If computer access is available, students can use the Campus Debris Data Summary Excel Workbook to analyze and graph their data. It is available on the cordellbank.noaa.gov website under Education/For Teachers section. The Excel workbook is preprogrammed to automatically generate the graph after students enter their data.

Alternatively, they may simply draw graphs by hand on the Campus Debris Data Summary Data Sheet or on the front chalk/dry erase board in the classroom. Once groups have had a chance to meet and analyze their data, reconvene as a class so that groups can share their findings. If possible, enter all of the data into one class spreadsheet so that the class may analyze the total sum of debris collected.

Part 3:

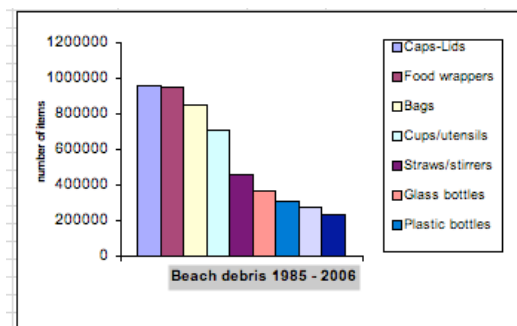
Making Connections

Using your knowledge of watersheds, how could the identified campus debris have found their way onto the beaches or oceans?

Answers may include:

- Trash can be carried in storm drains into larger bodies of water that eventually reach the ocean.
- Flooding can cause trash to move into larger bodies of water that eventually lead to the ocean.

Teacher Tip: Use Google Earth or topographic maps to show students the actual path from your local watershed to the ocean.



The table and graph depict debris collected in California during a Coastal Cleanup Study from 1985-2006.

Ask:

What conclusions can you draw from the beach debris found in California?

Answers will vary and may include:

- Caps and lids were the most frequently found items, followed closely by food items.
- Many of these items were plastic.
- A lot of trash was collected.

How do our results compare to these results?



Answers will vary.

How could you go about eliminating some of the debris at the source?

Answers will vary and may include:

- *Not littering*
- *Conducting community clean-ups*
- *Raising awareness*

THE “ME” CONNECTION

Part 4:

Conservation

Ask:

What can you personally do about the marine debris problem?

- *Design a marine debris investigation of your own and share your results!*
- *Put your rubbish in trash cans!*
- *Recycle!*
- *Join the thousands of volunteers that clean up beaches and off shore waters every year!*

Reduce the use of one-time use materials

Say:

“You are going to create a public awareness campaign to share with the school community.”

Campaign Goals

1. Advocates keeping your school campus clean and debris-free
2. Uses information from this lesson and gives reasons for keeping the area clean
3. Explains how local debris ultimately

affects the ocean and the organisms that inhabit it.

Be creative! Your campaign could take many forms including:

- Posters
- Brochures
- Podcasts
- Videos
- Other ideas?

Students should work in pairs for this activity. Alternatively, students may complete the activity for homework.

CONNECTIONS TO OTHER SUBJECTS

Math/Science
Social Studies
Environment

EVALUATION

Create rubric for working in teams for campus debris survey and quality of responses in discussion.
Create rubric for marine debris campaign

EXTENSIONS

Have students conduct debris surveys in other popular areas that students visit: Shopping mall/center, recreation areas, their home neighborhood, downtown, outside movie theatre and compare results.

Have students carry a bag around with them for 3 days straight and have them throw out every thing that they would have thrown in the garbage (within



reason) in that bag, have them sort/categorize the types of things they throw away, what can be reused? Replaced to something reusable? How can they personally reduce their waste?

Have students broaden their marine debris prevention campaign to campus administration, their local community, write letters to the local media and or local marine sanctuaries or non-profits that are working to protect marine life.

RESOURCES

<http://www.signalsofpring.net/aces>

Signals of Spring/ACES is an online education resource where you can have students look at animal migration maps, and explore ways to protect the environment. (this activity is also on this website)

<http://www.marinedebris.noaa.gov>

The NOAA Office of Marine Debris is working to find solutions to marine debris through research and education. There are some great facts, visuals, and photos and other education resources you can find on this website.

<http://oikonos.org/projects/oceanstewardship.htm>

Oikonos Ecosystem Knowledge has further information about marine debris and impact on seabirds and an extensive education section about marine debris and seabirds.

<http://sanctuaries.noaa.gov/> --Website of the National Marine Sanctuary Program

<http://sanctuaries.noaa.gov/education/> - National Marine Sanctuary Education Program website with sections specifically designed for students and for teachers.

CALIFORNIA SCIENCE EDUCATION STANDARDS

CA-Grade 6-Life Science-5

CA Grade 6-Investigation and Experimentation-7

CA Grade 7-Investigation and Experimentation

Grades 9-12-Ecology

NATIONAL SCIENCE STANDARDS

Evidence, Models, and Investigation
Life Science: Interdependence of organisms

Physical Science: Properties of objects and materials

Personal and Social perspectives: changes in environments, personal and community health, environmental quality, Nature and human induced hazards

OCEAN LITERACY ESSENTIAL PRINCIPLE:

The ocean and humans are inextricably interconnected

FOR MORE INFORMATION

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This lesson was originally developed by Carol Keiper of Oikonos Ecosystem Knowledge (www.oikonos.org) for the Benicia Water Education Program. It was



adapted by US Satellite for the Signals of Spring/ACES program (www.signalsofspring.net/aces) and is shared by all three organizations as an educational resource.

CREDIT

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